UNIVERSAL CHAP-STYLE COMPRESSION STOCKING

BACKGROUND OF THE INVENTION

Field of the Invention

[001] The present invention relates to a therapeutic compression stocking. More particularly, the present invention relates to a chap-style therapeutic gradient compression stocking that can be worn on either leg of a patient.

Description of Related Art

[002] Therapeutic gradient compression stockings have been used on a relatively wide scale to assist in the medical management of venous diseases and/or help prevent occurrence of deep vein thrombosis in patients. The purpose of such stockings is to overcome the elevated internal pressures within a human extremity caused by gravity or disease. Many forms of pressure gradient stockings have been constructed in a variety of lengths and styles. Also the degree of compression delivered by stockings covers a relatively large range and is dependent on the indication for use. To be classified as a gradient stocking the pressure profile of a properly fitted stocking should gradually decrease from the patient's ankles (distal end) up the leg (proximal end). The principal styles of such therapeutic gradient stockings are knee length stockings, thigh or full-length stockings, and panty style stockings.

[003] Therapeutic gradient compression stockings are designed to provide sufficient external circumferential counter pressure to help maintain more normal venous and lymphatic pressures at a given level of the extremity, thus assisting the movement of venous blood and lymph from the extremity. Another important effect of compression is the reduction of the venous volume that results in an increase of the venous flow velocity. This factor alone helps prevent stasis and helps reduce risk of deep vein thrombosis in the inactive patient (anti-embolism stockings). Edema reduction and edema prevention is the goal in patients with chronic venous insufficiency, lymphedema, and other edema causing conditions. Subcutaneous pressures increase with elastic compression that alters Starling forces thereby helping correct filtration and absorption abnormalities between the interstitial fluid and the microcirculation.

[004] Full-length stockings of various descriptions have been proposed and a variety of therapeutic medical gradient compression stockings are on the market. Unfortunately,

therapeutic stockings, in order to provide the necessary compression, are often thick and rather unsightly, difficult to maintain in proper position on the patient's leg or have a number of other drawbacks.

[005] An example of a typical full-length therapeutic stocking is shown in U.S. Patent No 3,975,929 to Fragile that describes an anti-embolism stocking made on a circular knitting machine with alternating courses of covered spandex yarn. The body of the stocking provides a gradually decreasing compressive force on the leg of the patient from the ankle toward the top. The stocking ends at the upper portion of the thigh below the crotch area. The stocking is held in place with an elastic band extending around the opening at the upper end of the leg portion. Another example of a typical therapeutic stocking is described in U.S. Patent No. 4,069,515 to Swallow, *et al.*, which discloses a therapeutic stocking having foot and boot portions of alternating courses of jersey knit stitches of non-elastomeric yarn. This thigh length stocking also has an elastic band that extends partially around the patient's thigh.

[006] United States Patent No. 4,048,818 to Cueman describes a full length circular knit therapeutic stocking having a foot and leg portion, an upper welt portion and a turned welt portion. This stocking includes a flexible and relatively inelastic welt panel insert having a substantially triangular shape. The stocking is knit as a cylindrical tube without any reciprocation to form a heel pocket or toe pocket. The top of the stocking stops below the crotch area. Another therapeutic stocking describing a panel insert is United States Patent No. 4,198,834 to Reid, Sr. that shows a full-length anti-embolism stocking that includes an improved means for adjusting the circumferential dimension of the upper thigh-engaging portion. The anti-embolism elastic stocking includes a leg portion and an upper thigh engaging portion knit with stretchable yarn to provide stretch thereto and to provide a compressive force against the leg and thigh of the wearer. A generally wedge-shaped insert is sewn into a slit extending downwardly in the upper thigh-engaging portion with the wider portion of the insert being positioned adjacent to the upper end of the stocking. The top of the stocking ends below the crotch area and an elastic tape supports the stocking on the patient's leg.

[007] United States Patent No. 6,135,974 provides a post-injury support hose that has graduated compression along a patient's extremity and has an opening for accessing the injured area. The compression hose includes an extremity covering portion and an injury area-covering portion. The injured area-covering portion has an opening and fasteners to permit closure of the

opening. A patient's extremity is inserted into the hose such that the opening is aligned with the injured area. Preferably, the medical compression hose has a graduated compression force that is greater in the distal area of the extremity and gradually decreases along the length of the hose toward the proximal end.

[008] United States Patent No. 4,180,869 to Pendergrass, *et al.*, discloses a full length stocking having a boot portion, a waist support means and a hip panel extending between the waist support and the boot portion. The waist support means has an elastic band secured by suitable means to the upper end of the hip panel and arranged to extend around the hip to the back of the patient. The stocking described can be worn on only one or the other of the patient's legs.

[009] As noted, a drawback of each of the prior art stockings described above require a differently constructed stocking for each leg if the stocking is to be supported by a waistband. It can therefore be readily seen that a single stocking that can be worn on either leg would be beneficial.

BRIEF SUMMARY OF THE INVENTION

[010] A principle feature of the present invention is the provision of a full-length therapeutic gradient compression stocking that may be worn on either leg. It has been found that a chap-styled therapeutic medical stocking that includes a foot portion, a leg portion having a lower leg portion extending from the foot portion upward above the knee to an upper leg portion, a waist support and a hip portion extending between the waist support and the upper leg portion may be made with stretchable yarn to provide a compressive force against the lower leg and thigh of a patient and constructed so as to be worn on either leg. In a preferred embodiment, the stocking is knit so that the pressure in the ankle area is greatest and gradually decreases from the patient's ankle (distal end) through the thigh portion (proximal end).

[011] The hip portion is formed between the thigh portion and the waist support and covers the area below the waist of the patient to the upper leg portion. The hip portion is formed around the lower waist of the patient and has cutouts on each side of the hip portion, sized to accommodate the crotch area of the patient so that the stocking may be worn on either leg. The foot portion of the stocking may be closed or may have a toe opening that overlies the toes when

the stocking is worn. The outer end of the toe portion of the stocking may be pulled over the toes to inspect the toes through the opening without removal of the stocking from the patient.

[012] The therapeutic gradient compression stocking is held in place on the patient's leg by a waist support or waistband that includes a strap-engaging loop formed at the top of the hip portion. The strap-engaging loop may be knit when the stocking is formed or sewn onto the top of the hip portion. The strap-engaging loop extends around the circumference of the hip portion at the front and rear of the portion but not above the cutouts. Through the strap-engaging loop is a waist strap that may be composed of any well-known material. In a preferred embodiment, the strap has Velcro®-type fasteners on either side so that the strap may be easily opened and closed from either side depending upon which leg the stocking is being worn. In another embodiment, the waist strap may be sewn to the waistband. It should be understood, however, that other types of fasteners such as buttonhole in the elastic waistband might be used.

[013] It is an objective of this invention to provide a knit therapeutic gradient compression stocking having a defined heel such as a reciprocated heel that is constructed so that it may be worn on either leg of a patient and maintained in place on the patient's leg by a support around the patient's waist.

[014] Another object of the present invention is to provide a therapeutic gradient compression stocking having a single waistband to be worn on either leg of a patient having a venous inflammatory disease.

[015] Still another object of the present invention is to provide a therapeutic gradient compression stocking in which elastomeric and non-elastomeric yarns are knit on a circular knitting machine in conjunction with non-elastomeric yarn to provide a compressive force on the leg of a patient and to provide an opening in the upper portion of the stocking so that the stocking may be worn on either leg of a patient.

[016] Other objects features and advantages of the present invention will become apparent in the following detailed description of the embodiments of the invention when taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[017] Having thus described the invention in general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

[018] FIG. 1 is a front view of the therapeutic gradient compression stocking of the present invention being worn on the right leg of a patient;

[019] FIG. 2 is a front view of the therapeutic gradient compression stocking of the present invention being worn on the left leg of a patient;

[020] FIG. 3 is a perspective view of the therapeutic gradient compression stocking of the present invention showing the waist support as the stocking would be worn on the right leg;

[021] FIG. 4 is an perspective view of the therapeutic gradient compression stocking of the present invention showing the waist support as the stocking would be worn on the left leg;

[022] FIG. 5 is a view looking downwardly into the waist opening of the stocking, as it would appear on the right leg of the wearer;

[023] FIG. 6 is a view looking downwardly into the waist opening of the stocking, as it would appear on the left leg of the patient; and

[024] FIG. 7 is a side view of the therapeutic gradient compression stocking of the present invention being worn on the left leg of a patient.

DETAILED DESCRIPTION OF THE INVENTION

[025] The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all embodiments of the invention are shown. Indeed, these inventions may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout.

[026] Referring now to FIGs 1, 2 and 7, the versatility for the full-length therapeutic gradient compression stocking of the present invention is shown as being capable of being worn on either leg of a person. There is shown the chap-styled therapeutic stocking generally designated **10** that includes a foot portion **12,** a leg portion **14** having a lower leg portion **16** extending from the foot portion upward above the knee to an upper leg or thigh portion **18**, a waist support **20**, and a hip portion **22** extending between the waist support **20** and the upper leg portion **18**. The foot portion **12** and the leg portion **14** exert a compressive pressure against the patient's leg to increase the flow of blood in the leg and reduce the incidence of thromboembolism in the patient. In the preferred embodiment, the stocking is knit so that the pressure in the ankle area (distal

end) is greatest and gradually decreases from the patient's ankle to the upper thigh (proximal end).

[027] As illustrated more clearly in FIGs 3 and 4 showing the stocking being worn on the right leg of a patient and the left leg of a patient, respectively, the hip portion **22** is formed between the thigh portion **18** and the waist support **20** and covers the area below the waist of the patient to the upper leg portion. The hip portion **22** is formed around the lower waist of the patient and has cutouts **24, 24'** on each side of the hip portion **22**. The hip portion **22** may be knitted to the upper leg portion **18** or may be sewn on to the upper leg portion as a separate piece. The cutouts are sized to accommodate the crotch area of the patient so that the stocking may be worn on either leg. The cutouts may be made by simply slitting along the centerline of both the left and right sides of the hip portion. The edges of both slits are bound or finished. As shown in FIG. 7 when the stocking **10** is worn on the left leg, the cutout **24** appears to be more or less in a closed position. Once the cutouts **24, 24'**are made the hip panels cover from about 30% to 50% of the waist area above the thigh. The hip panel may be knit from alternating courses of jersey knit stitches of a covered elastomeric yarn but it should be understood that other yarns and stitches may be used.

[028] The foot portion **12** of stocking **10** may have a toe opening **11** that overlies the toes when the stocking is worn, as shown in FIGs. 3 and 4. Accordingly, the outer end of the toe portion of the stocking may be pulled over the toes to inspect the toes through the opening **11** without removal of the stocking from the patient. However, the stocking may be either open-toed or closed-toed. The heel portion **13** of the stocking is constructed in such a way that it forms a defined heel such as a reciprocated heel on either foot.

[029] FIG. 5 is a view looking downwardly into the waist opening of a stocking, as it would appear on the right leg of the wearer. FIG. 6 is a view looking downwardly into the waist opening of the stocking, as it would appear on the left leg of the wearer. As shown, the therapeutic compression stocking **10** is held in place by a waist support or waistband **20**. The waist support **20** has a strap-engaging loop **26** formed at the top of the hip portion **22**. The strap-engaging loop **26** may be knit when the stocking is formed or sewn onto the top of the hip portion **22**. In either event the engaging loop **26** is hemmed, if need be, in a manner to accommodate a belt type construction that can be slid from the left to the right or the right to the left. The strap-engaging loop **26** extends around that portion of the circumference the hip panel

20 at the front and rear of the panels but not above the cutouts **24, 24'**. Through the strap-engaging loop **26** is belt or waist strap **28** which may be composed of any well-known material and which may be opened or closed on either side depending upon which leg the stocking is being worn. In a preferred embodiment, the strap **28** has Velcro®-type fasteners **30, 30'** on both the left and right side so that the strap **28** may be easily opened when the stocking is worn on either leg. In a related embodiment two stockings may be combined on a single waistband to form a two leg garment. The ability to add a second leg is beneficial when one leg is ready for compression before the other or when different compression constructions are required for the left leg and the right leg. It should be understood, however, that other types of fasteners might be used. It should also be understood that in another embodiment, the waist strap **28** may be attached or sewn to either side of the stocking hip portion **22** rather than pass through engaging loop **26** and adjusted to a minimal length on the affected side. To prevent loss in laundering, the waistband may be attached or otherwise configured to keep it from sliding out of the strap-engaging loop and still move freely within the strap-engaging loop.

[030] The universal chap-style therapeutic gradient compression stocking **10** of the invention is show in FIGs. 3 and 4, as the stocking would be worn on either leg, respectively. Most of the patients suffering from minor to moderate varicosities, moderate edema, superficial thrombophlebitis, and post sclerotherapy need to use stockings with the compression at ankle in the range of 15 – 20 to 20 – 30 mm Hg. More complicated and severe cases require pressure of 40 mm Hg and higher.

[031] The preferred spandex or elastomeric yarns employed to achieve the desired power or modulus of elasticity for the retractive or compressive force is 420d Creora spandex, knit with the non-elastomeric yarns. It has been further found desirable to achieve the desired retractive or compressive force to feed the spandex yarns under controlled tension before reaching the yarn finger and knitting elements where the tension will be increased but cannot be measured accurately. These stocking may be knit on a conventional knitting machine such as a Pendolina Medical circular knitting machine.

[032] Many modifications and other embodiments of the inventions set forth herein will come to mind to one skilled in the art to which these inventions pertain having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the inventions are not to be limited to the specific embodiments disclosed and

that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.